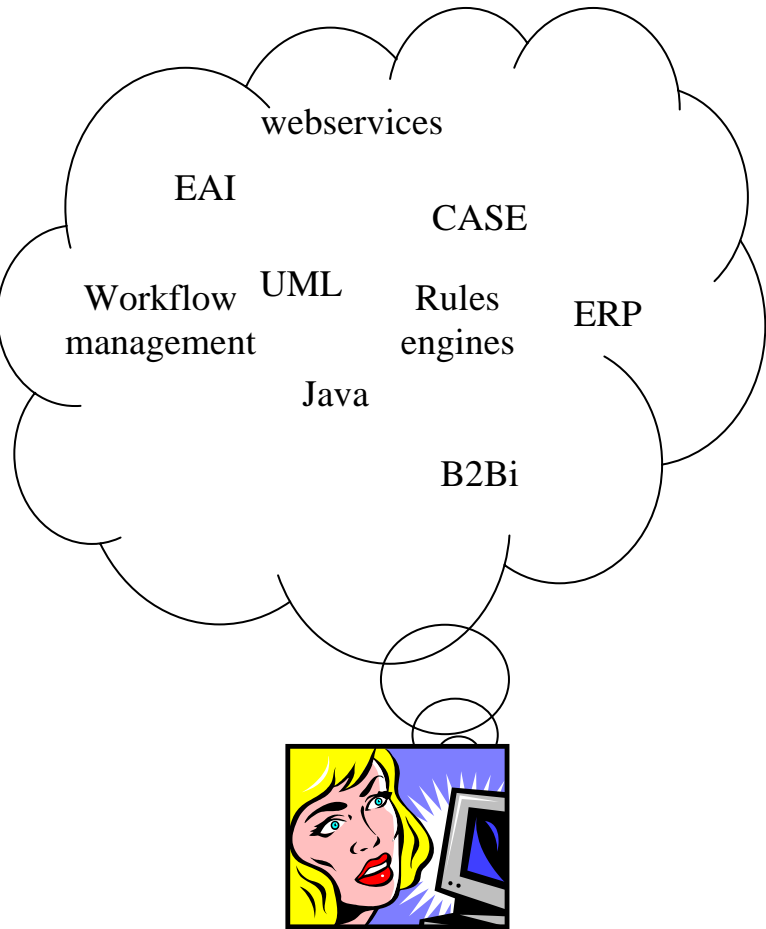

Business Process Modelling

Service Modelling

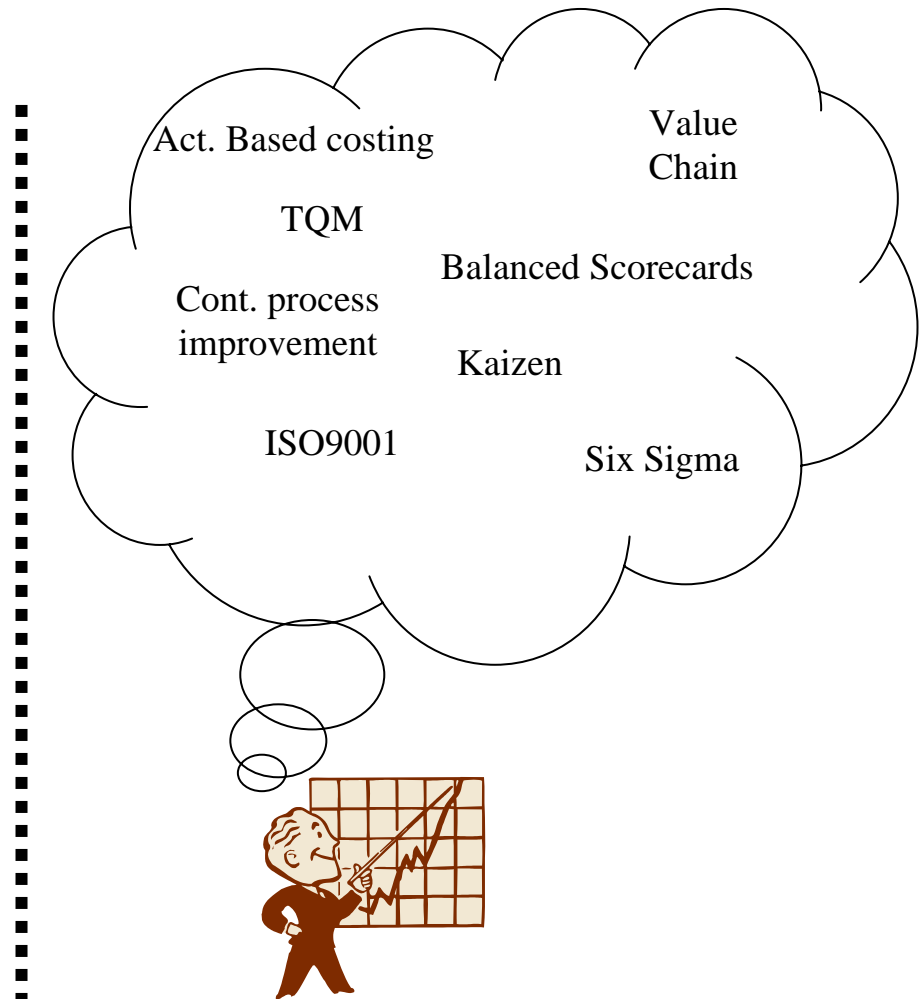
Purpose of lecture

- To get an understanding of challenges in
 - understanding,
 - modeling and
 - IT implementing a business process
- BPM
 - Diagram
 - method
- Earlier knowledge be used
 - UML activity diagrams
 - Models based on XML

View of processes and organization



IT organization

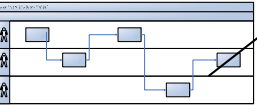


Business organization

Agenda



- Introduction
- Business Process Modelling
- IT support for business processes;
Workflow Management
- Development process
- Workflow Patterns
- Web services composition
- BPEL4WS
- Summary



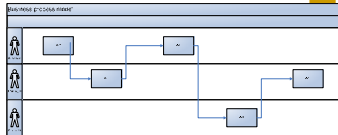
Business Process Modelling



■ What is a business process

- It is the way a company handles a business request, eg. a loan request in a bank, or an incoming order in a shipping company. It is nothing concrete, it is the way people and systems interact to handle a business request.

■ What is a model of a business process

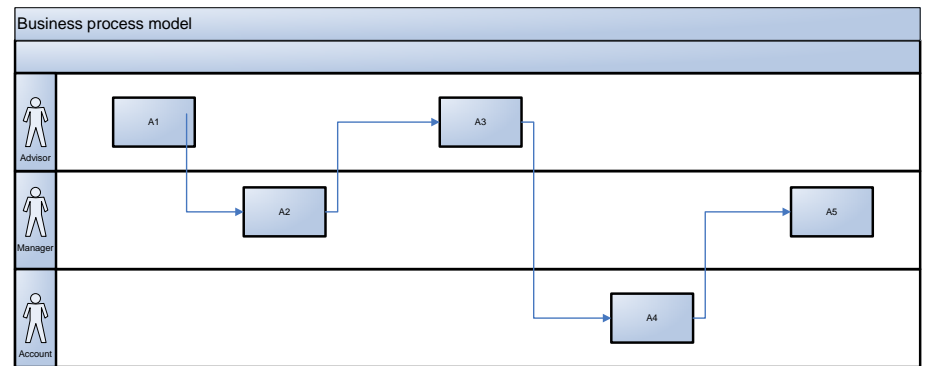


- An abstraction of the way people and systems interact to handle a business request described in some kind of language, eg. UML Activity diagrams.
- A simplified view of the complex reality
- Externalization and formalization of knowledge and expertise within applications and minds.

Business Process Modelling



Real business process



Model of business process

Definitions

- A *process* is a particular course of action intended to achieve a result (synonym: *procedure*) a series of actions or operations conducing to an end; especially: a continuous operation or treatment especially in manufacture.
-
- A *function* is a professional or official position: Occupation.
-
- An *activity* is a natural or normal function: as a process (as digestion) that an organism carries on or participates in by virtue of being alive; a similar process actually or potentially involving mental function; an organizational unit for performing a specific function; also: its function or duties.
-
- A *task* is a usually an assigned piece of work often to be finished within a certain time; a duty or function.
- So a *task* can be a function, and an activity can be a process or a function. To further complicate things, the word “procedure” shows up too. It usually means a defined series of steps and decisions to accomplish some task or activity.

Definitions –IT , computer

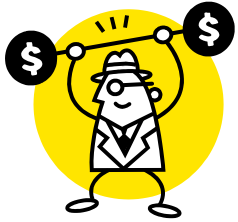
-
- A *process* is an executing program. A process consists of the program code (which may be shared with other processes which are executing the same program), and some private data
-
- A *function* is a computer subroutine; specifically: one that performs a calculation with variables provided by a program and supplies the program with a single result ; or a set sequence of steps, part of larger computer program: subprogram, procedure .
-
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Business Process

- “A *business process* is a collection of interrelated work tasks, **initiated in response to an event**, that achieves a specific result for the *customer* of the process.

Business Process Modelling

- Advantages of modeling the business processes
 - Better understanding of existing business processes
 - Documents the business process
 - Basis for improving existing business processes
 - Basis for experiencing and simulating new concepts and impact on the organization
 - Basis for continued optimization
 - Basis for creating information systems that support the business processes
 - One type is known as Workflow Management Systems



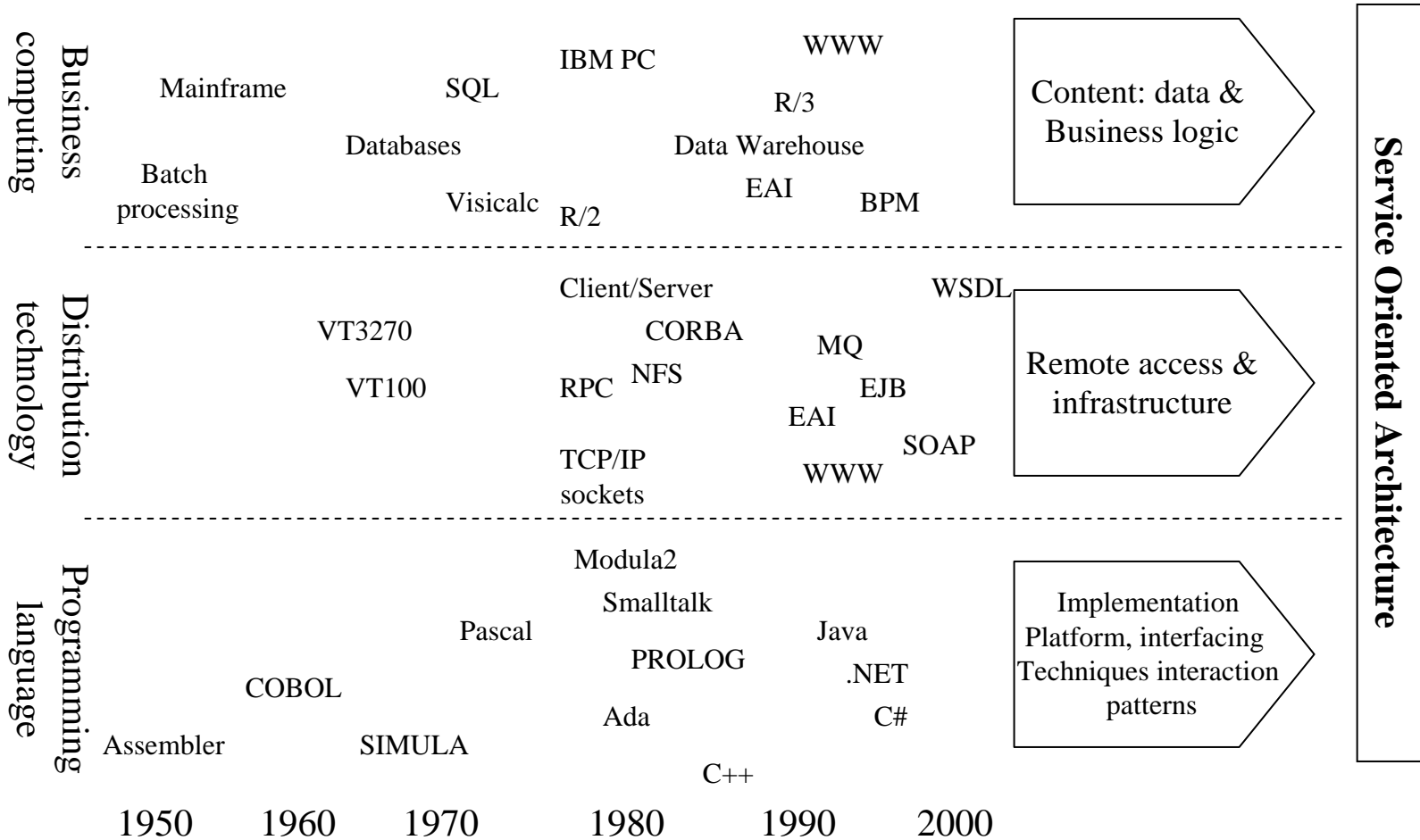
Business Process Modelling



■ Challenges

- ❑ Difficult to model the world with people and systems interacting together.
- ❑ Real world process is not understood
- ❑ Different people has different views of the process
- ❑ Processes often cross organizational borders
- ❑ No common vocabulary to use
- ❑ Many different aspects of a process. It can consist of several models at different abstraction levels linked together.

History of SOA



Classification of Services

- **Basic services**; represent the basic elements of a SOA
 - Data centric services
 - Logic centric services
- **Intermediary services**; are stateless services that function as client of server in a SOA
- **Process centric services**; encapsulate the knowledge of the organization's business processes (maintain the process state)
- **Public enterprise services**; provide interfaces for cross-enterprise integration

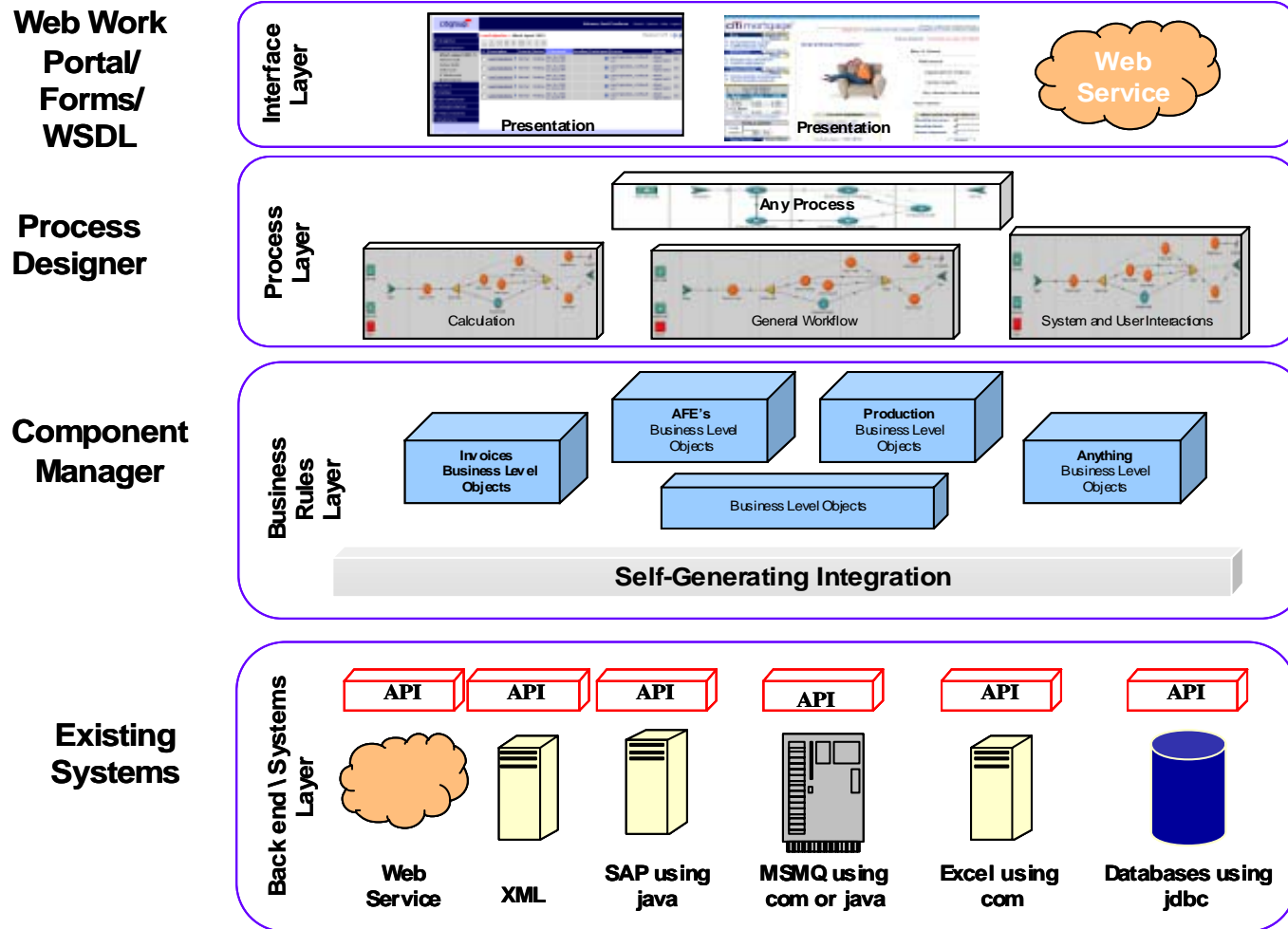
Application frontends are the active elements of a SOA. They initiate all business processes and ultimately receive their results (e.g. GUI)

Classification of Services (2)

	Basic Services	Intermediary Services	Process-centric services	Public Enterprise services
Description	simple data or logic centric services	technology gateways, adapters and functionality adding services	encapsulate process logic	service shared with other enterprises or partner organizations
Implementation complexity	low to moderate	moderate to high	high	service specific
State management	stateless	stateless	stateful	service specific
Reusability	high	low	low	high
Frequency of change	low	moderate to high	high	low
Mandatory element of SOA	yes	no	no	no

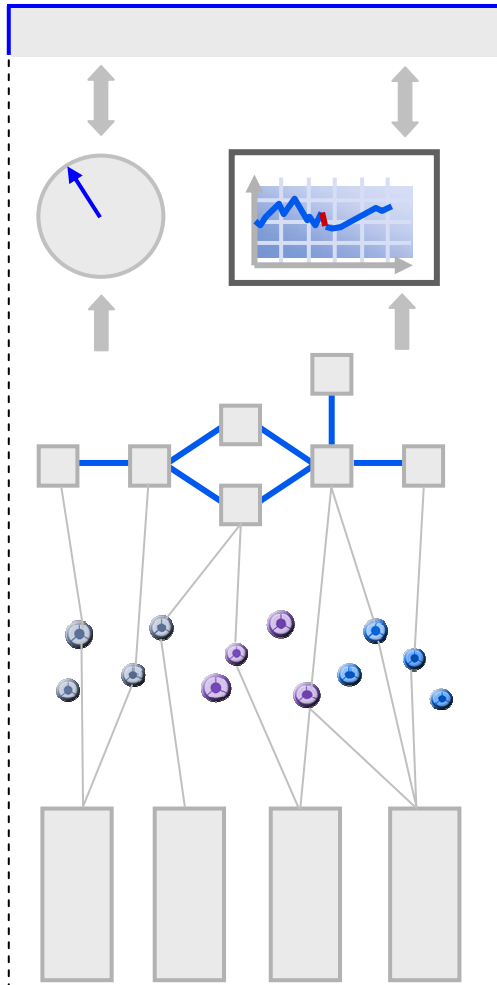
BPMS Architecture

Example - 1



BPMS Architecture

Example - 2



Role Based Presentation + Applications (**CAF**)

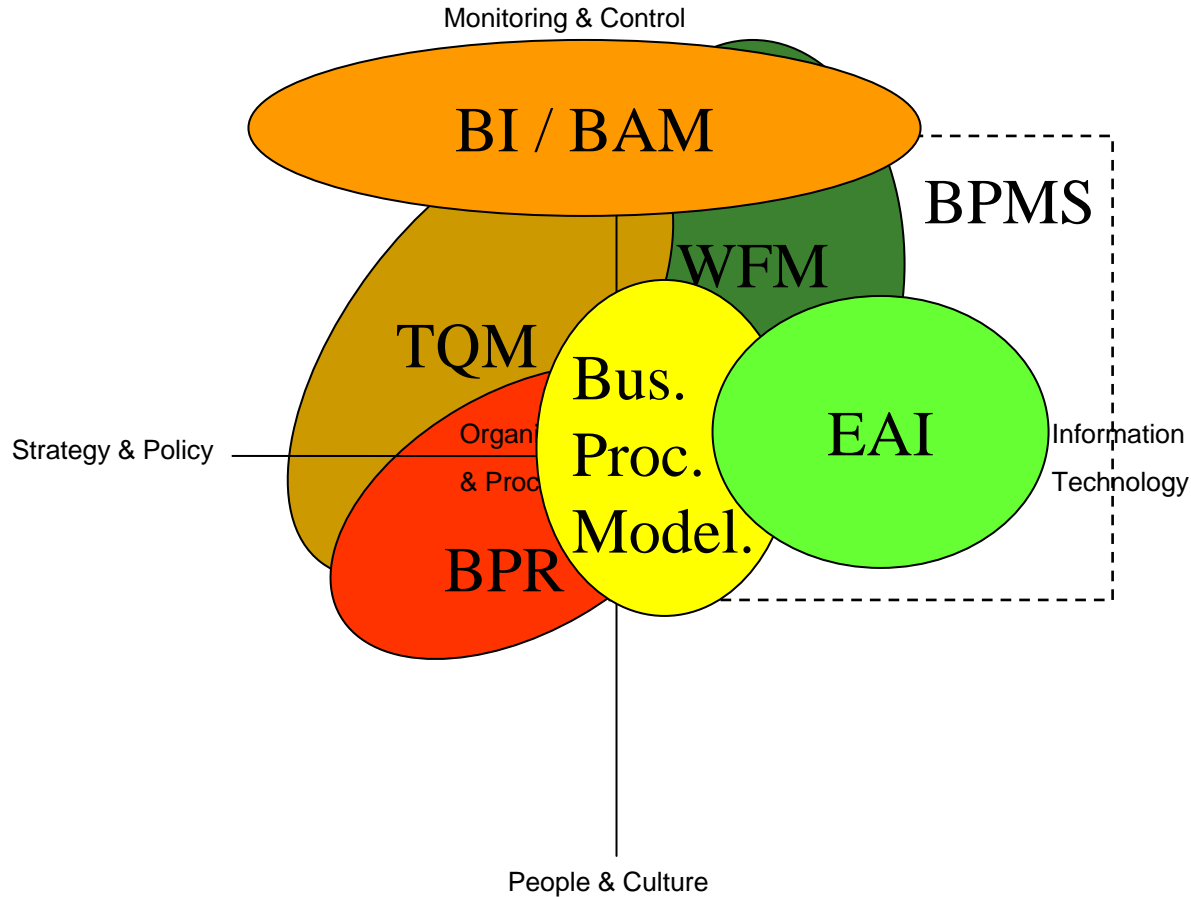
Business Activity Monitoring (**BAM**)

Business Process Management (**BPM**)

Enterprise Service Bus (**ESB**)

Enterprise Applications (**ERP + others**)

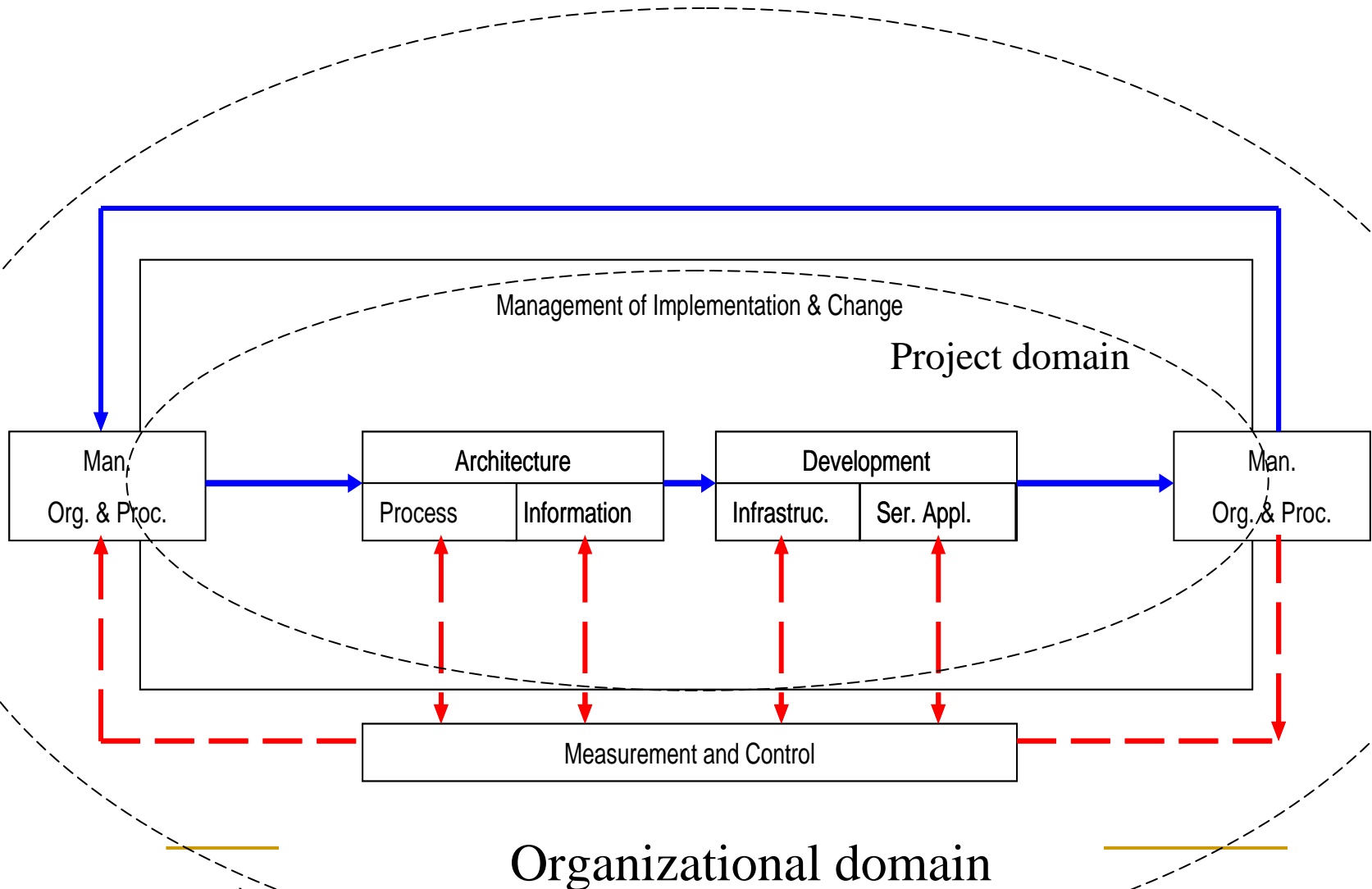
Business Process Management Framework



Business Process Modelling

- Live Example: Loan request
 - Using interviews, analysis and other ethnographic methods, a business process can be surveyed
 - Traditional process for customer adviser:
 - Business Procedure:
 - Receives the loan request at a paper.
 - Collect information about customer
 - If loan amount > 10000 Euro, give case to manager
 - Else make a risk analyses. From result approve or give case to manager.
 - Requires lot of manual work for customer adviser

Business Process Management System Implementation approach

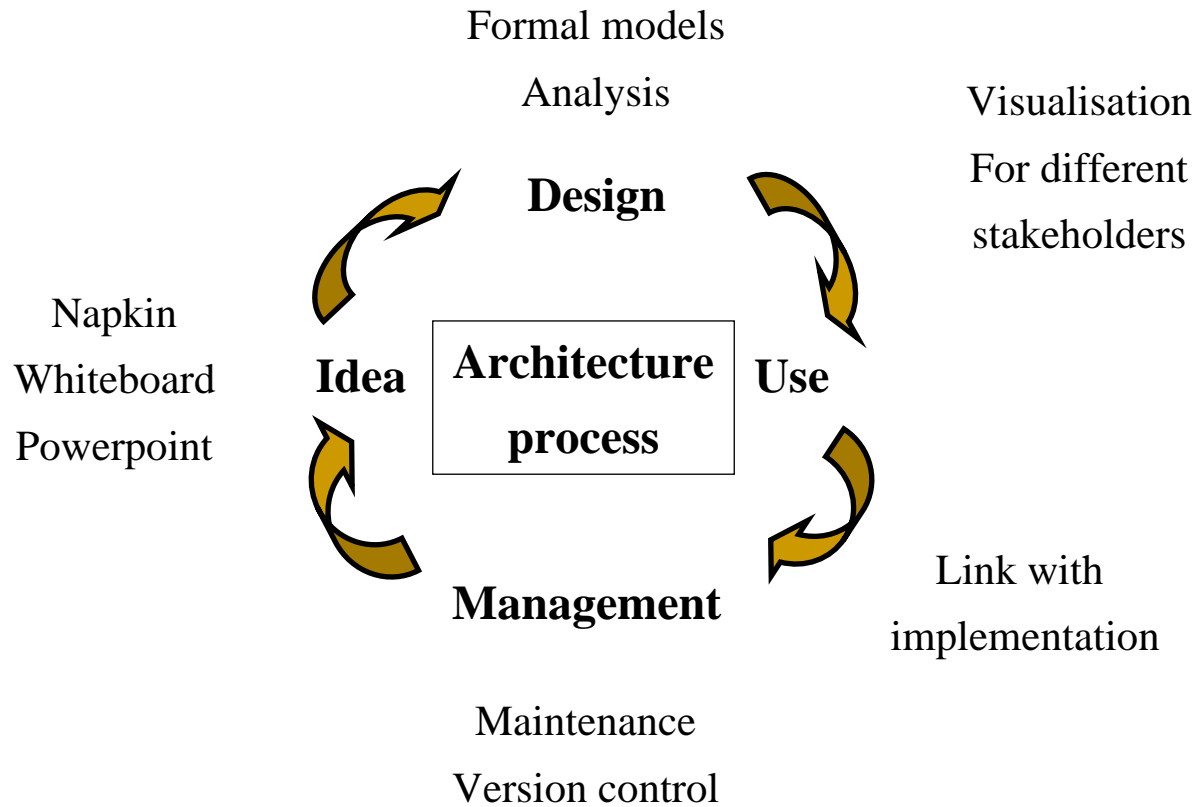


(Ravesteyn, 2007)

Business Process Modelling

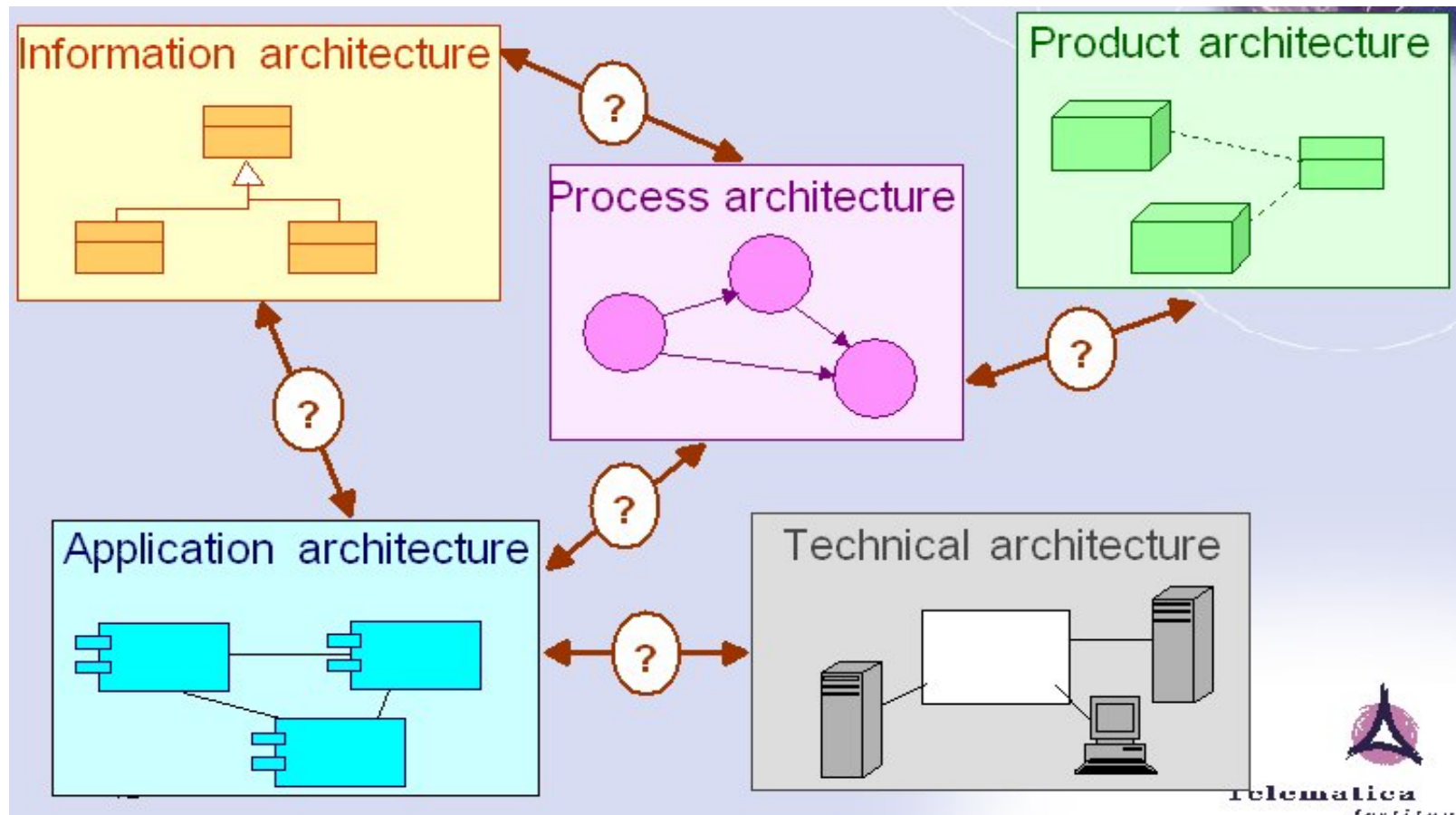
- Many modeling techniques and tools
 - DFD, ISAC, SADT, UML, BPMN, ...
 - Simulation tools, design tools, CASE tools, WFMS, ...
- A hot standard is BPMN
 - (Business Process Modeling Notation) by BPMI.org
 - OMG and BPMI has recently merged.
- Why use *UML* activity diagrams.
 - Well known standard
 - Proved its value. Large tool support
 - Very high expressiveness
 - Can implement all 20 workflow patterns

Architecture Design (process model)



The architecture description life cycle (Lankhorst et al. 2005)

Architecture Design (coherence)



(Lankhorst et al. 2005)

Business Process Modelling

- Business Process Modelling Notation(BPMN)
 - Similar to UML activity diagrams
 - Contains much more symbols-> easier to visualise how the process should behave.
 - Can model most of the 21 workflow patterns

Business Process Modelling

A business process model typically defines the following elements:

- The Goal or reason for the process
- Specific inputs
- Specific outputs
- Resources consumed
- Activities that are performed in some specific order
- Events that drive the process

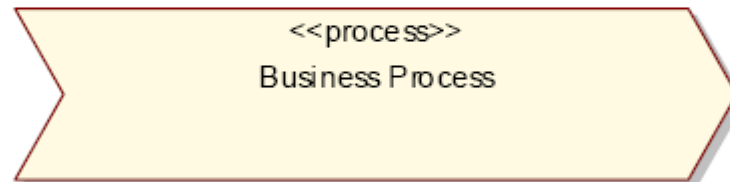
Business Process Modelling

The business process:

- May affect more than one organizational unit
- Often has a horizontal organizational impact
- Creates value of some kind for the customer who may be internal or external

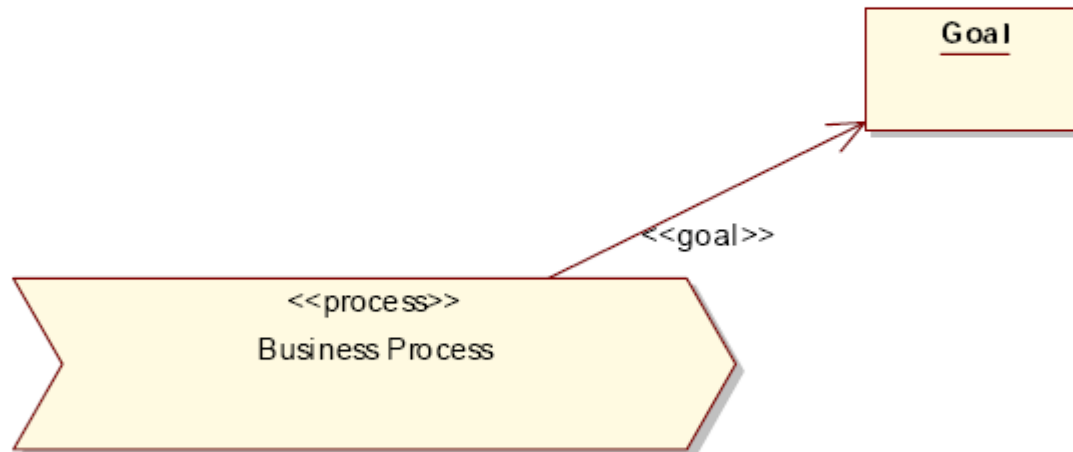
The Business Process:

A business process is a collection of activities designed to produce a specific output. It implies a strong emphasis on how the work is done within an organisation, in contrast to a product's focus on what. A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs: a structure for action.



Goals:

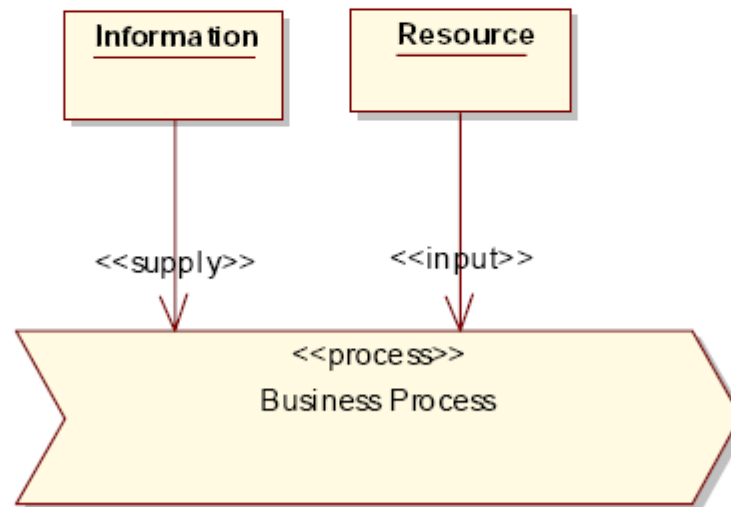
A business process has some well defined goal. This is the reason the organization does this work, and should be defined in terms of the benefits this process has for the organization as a whole and in satisfying the business needs.



Inputs, Resources and Information:

Business processes use information to tailor or complete their activities. Information, unlike resources, is not consumed in the process - rather it is used as part of the transformation process. Information may come from external sources, from customers, from internal organisational units and may even be the product of other processes.

A resource is an input to a business process, and, unlike information, is typically consumed during the processing.



Outputs:

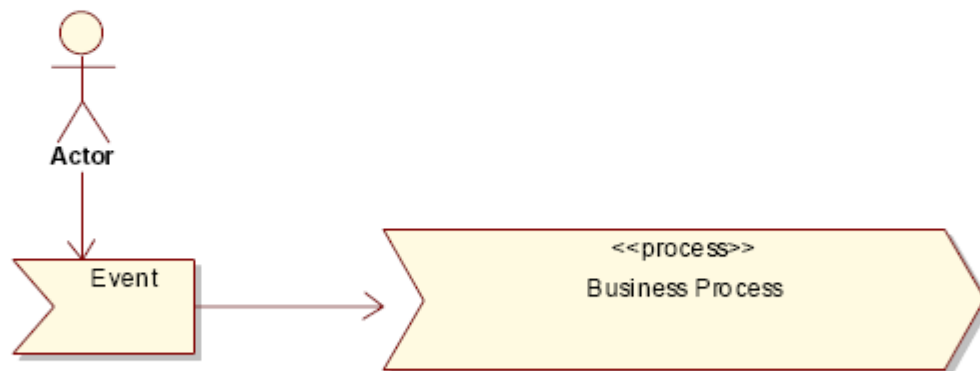
A business process will typically produce one or more outputs of value to the business, either for internal use or to satisfy external requirements. An output may be a physical object (such as a report or invoice), a transformation of raw resources into a new arrangement (a daily schedule or roster) or an overall business result such as completing a customer order.

An output of one business process may feed into another process, either as a requested item or a trigger to initiate new activities.



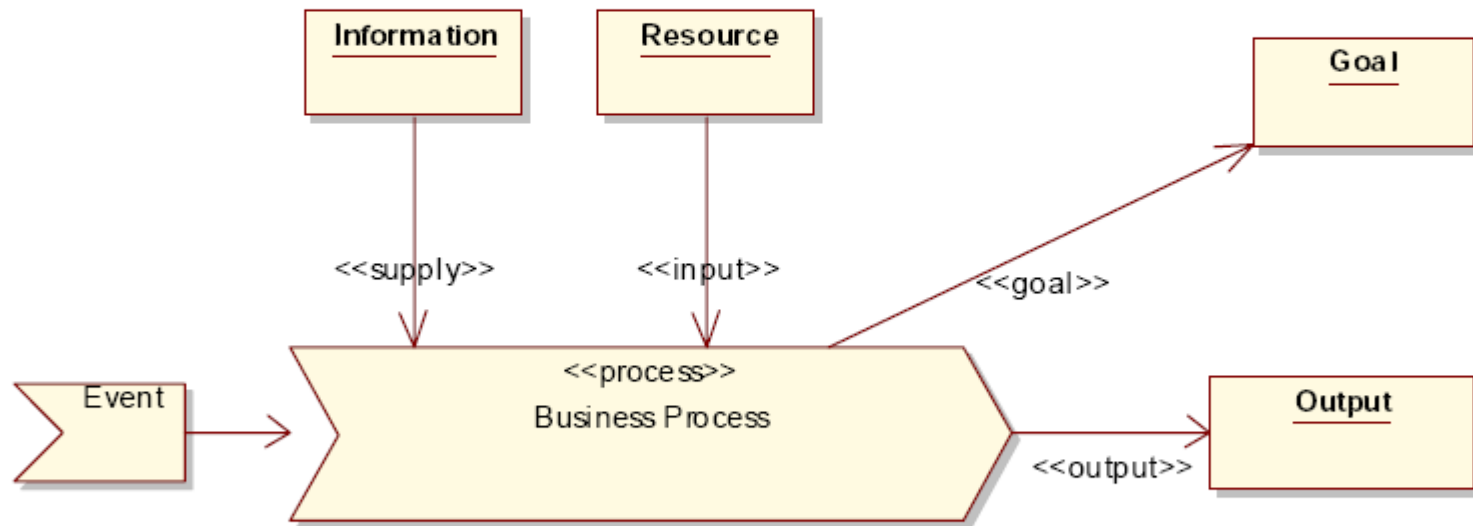
Events:

An event is the receipt of some object, a time or date reached, a notification or some other trigger that initiates the business process. The event may be of the "real world," consumed and transformed (e.g. a customer order) or simply act as a catalyst (e.g. a "time grain marker").



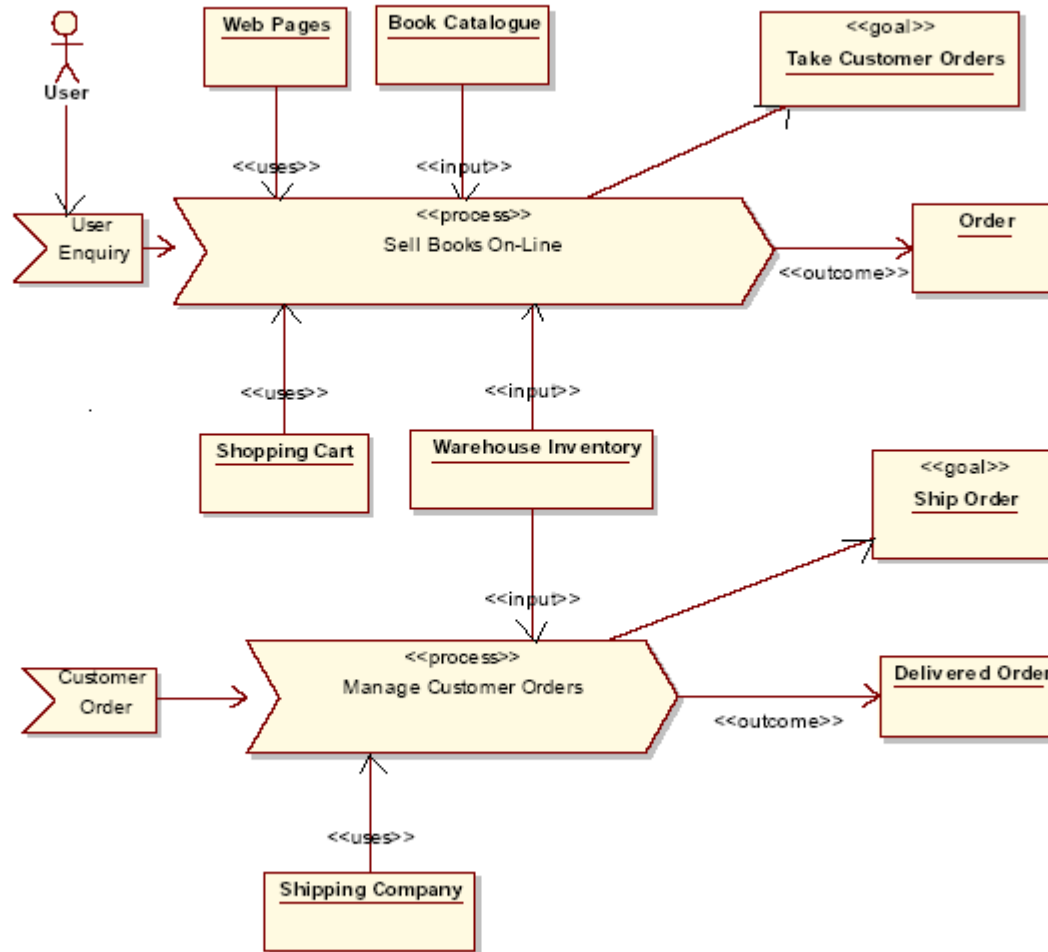
Putting it together:

The diagram below illustrates how the various model elements may be grouped together to produce a coherent picture of a named business process. Included are the inputs, outputs, events, goals and other resources which are of significance.



© Geoffrey Sparks 2000

An Example:



Business Process Management or BPM

- is the practice of improving the efficiency and effectiveness of any organization by automating the organization's business processes. BPM has evolved from Business Process Reengineering (BPR).

Isn't BPM just workflow by another name?

- To some extent- yes. Like BPM traditional workflow products support the automation of business processes via the definition of process steps and the exchange of data between steps.
- But in one key respect BPM is different. BPM is typically used as a means of integrating existing applications and services and the business processes that operate on these, rather than implementing a single discrete business process. Workflow processes tend to be prescriptive step-by-step definitions, whereas BPM process definitions typically encompass the higher-level business functions involved in a process and the outputs from these functions.

Isn't BPM just workflow by another name?

- Its ability to view business processes across applications is referred to as 'process orchestration' – contrasting with the 'process automation' offered by traditional workflow products.
- BPM represents an important evolution of workflow technology, introducing a more rounded interpretation of real-life business processes and reducing the need for the rigid coding of every process step. This ability to provide process governance at the organization-wide level gives BPM a role in application integration – a key driver for its success.
- BPM is often presented as the solution to many of the long-standing architecture problems associated with the proliferation of legacy systems.

Examples of tasks that an organization performs that can be modelled and managed:

- Expense Reports
- Travel Requests
- Purchase Order Processing
- Human Resource Management
- New Accounts and Credit Authorizations
- Sales Order Processing
- Project Management
- Software Change Management

What are the key technologies that underpin BPM?

- **BPM IDE.** Business Process Management (BPM) IDE is an integrated design environment used to design processes, rules, events and exceptions. Creating a structured definition of each process is very important to any business and the IDE enables a business user to design all processes with no help from IT.
- **Process Engine.** The process engine of a Business Process Management solution keeps track of the states and variables for all of the active processes. Within a complex system, there could be thousands of processes with interlocking records and data.
- **User Directory.** Administrators define people in the system by name, department, role and even potential authority level. This directory will enable tasks to be sent automatically to the defined resources.
- **Workflow.** This is the communication infrastructure that forwards tasks to the appropriate individual.
- **Reporting/Process monitoring.** Enables users to track the performance of their current processes and the performance of personnel who are executing these processes.
- **Integration.** Enterprise Application Integration (EAI) and/or Web services is critical to BPM as business processes will require data from disparate systems throughout the organization.

Why are many organizations wary of investing in BPM systems?

- Many organizations currently have point solutions in place providing some of the elements of the overall BPM solution, but the move to a complete BPM approach requires change and investment orders of magnitude greater than is needed for the implementation of one part of the whole picture. The amount of effort required to systematize documents, records, knowledge and workflows is enormous and expensive.
- The risks involved are also correspondingly larger as in order to achieve high levels of improved productivity rationalization and redesign of business processes is likely to be needed and an all-embracing project has a high propensity to disrupt current systems or even to fail.

Figure 6-3. BPMN insurance claims process

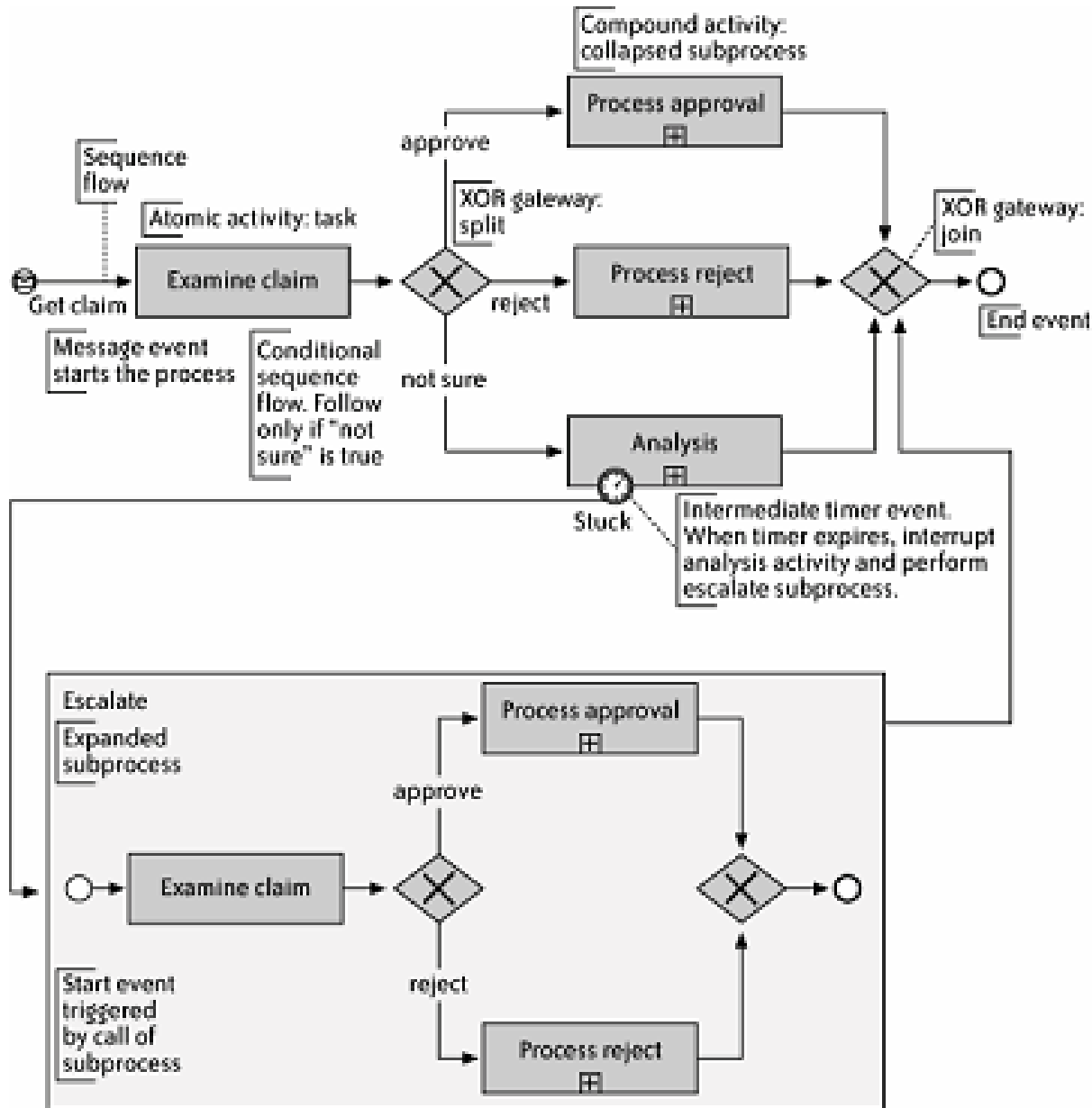


Figure 6-4. BPMN events
























Start	Intermediate	End	Name
			Basic
			Message
			Timer
			Rule
			Exception
			Cancellation
			Compensation
			Link
			Multiple
			Termination

Table 6-1. BPMN event description

Type	Start	Intermediate	End
Basic	Placeholder event or the start of a called subprocess.	Placeholder	Placeholder or end of a subprocess.
Message	Process is started by receipt of a message (e.g., the invocation of a web service method implemented by the	Process is waiting for a message (e.g., wait for response from a participant to which this process	A message is to be sent to a participant process (e.g., call its web service).

Table 6-1. BPMN event description

Type	Start	Intermediate	End
	process).	has sent a request).	
Timer	The start event defines a schedule for when it triggers (e.g., every Tuesday at midnight).	A point in a defined schedule has been reached.	
Rule	A condition, defined by the process, is met (e.g., process starts when a stock's price hits its 52-week high).	A condition is met. Used only for exception handling.	
Exception		Throw or catch an error.	Generate an error.
Cancellation		Perform cancellation for a given activity.	Cancel the transaction.
Compensation		Trigger and perform compensation handling.	Perform compensating action.
Link	The link start event connects to the link end event of a sibling process.	Link to or from another activity.	Connect to the link start of a sibling process.
Multiple	Two or more triggers can start the process; if any one of them occurs, the process starts. These triggers can be message, timer, rule or link types.	Two or more triggers can continue a waiting process; if any one of them occurs, the process resumes.	When the process ends, several results are required (e.g. several messages need to be sent).
Termination			Terminate all activities in the process. Perform no exception handling or compensation.

Why are many organizations wary of investing in BPM systems?

- The level of user acceptance is difficult to ascertain in advance for such a broad endeavor and many organizations are wary of the big-bang approach often required for the adoption of critical components such as electronic records management (ERM).
- A major problem that business faces in the adoption of BPM technologies and software are the difficulties involved in producing a clear cost-benefit justification. Smaller, less ambitious, departmental solutions are easier to specify, justify and fund.

The four tenets of BPM are:

- **Modelling** — Graphically defining or building a business process representation that accounts for: all needed process assets, multiple steps, subprocesses, parallel processes, process fulfillment paths, rules, exception handling and error handling.
 - **Integrating** — Connecting process assets so they can seamlessly exchange information to achieve goals. For applications, this means using Application Program Interfaces (APIs) and messaging. For people, this means creating a workspace on the desktop or wireless device for fulfilling their part of the process.
 - **Monitoring** — Providing a graphical administrative console that shows processes in progress, completed processes, and associated metrics.
 - **Optimizing** — Analyzing, through a common user interface, the monitored processes to look for inefficiencies, and the ability to act on or change processes in real-time to improve efficiency.
-

With a robust BPM solution, :

- Model a process from start to finish
- Generate the necessary integration among the various systems that the process crosses
- Create exception handling and alternative processes
- Monitor the health and fulfillment cycle of the process
- Assign fulfillment assets according to workload availability
- Change the process for added efficiency
- Add or subtract application assets to fulfill the process.

The 10 Pillars of BPM

(following McDaniel eAI Journal Nov. 2001)

- **Unified process automation and workflow model** — Because fulfilling processes requires the combining automated applications and human actions, process models must reflect and integrate both systems and people.
- Processes are rarely completely automated. Knowledgeable employees are needed to make key decisions and handle exceptions and errors. One process model that incorporates the entire process and its incumbent steps is essential. Having one model simplifies how the business understands and manages its processes.
- The purpose is to create an ideal, collaborative synergy between people and systems.

The 10 Pillars of BPM

- **Direct model execution and manipulation**— Building a process model is only a stage in implementation. When the unified model is created, the BPM solution must be able to generate the necessary integration code needed to pull the appropriate applications and people together into the run-time environment.
- This requires the BPM solution to have versatile, powerful adapters for handling the application integration, a robust messaging infrastructure for communications, and a rich user interface for publishing work items to employees.
- Furthermore, the process model must be separate from the underlying applications and people that changes in the application architecture won't break the process model and changes in the process model won't break the integration logic among assets.

The 10 Pillars of BPM

- **State management** — The BPM solution must keep track of the states of all processes, regardless of their length, complexity or current status.
- Enterprises need to have accurate control over what state a specific process is in.
- Also, maintaining current and historical state information will enable identification of problems, bottlenecks, added optimization, and greater return-on-process efficiency. State management is a proactive, action element that empowers users with the information needed to make decisions and changes that will positively impact process flow.

The 10 Pillars of BPM

- **Time-based exception management** — Exceptions to processes are often more the rule than the exception. Business complexity, customer demands, and market changes often dictate quick decisions and changes to processes.
- Strong exception-handling capabilities are needed to adequately cope with the dynamic nature of business. Additionally, exceptions by definition require special handling, usually in a short time window. Because so much of a business involves exceptions and special handling, automating these will improve productivity and decrease costs.

The 10 Pillars of BPM

- **Robust process monitoring and analysis** — Ongoing and real-time monitoring of processes is crucial for better operational efficiency.
- A BPM solution becomes a critical knowledge center for an enterprise's entire operations. Immediate knowledge of how moving processes are affecting performance provides the critical means for improvement. Sound decisions rely on an ability to react and support new processes, changes to existing processes, and termination of faulty processes.
- Monitoring the health of the process environment helps leaders make such informed decisions. This requires rich, analytical processing — executed in multiple dimensions — across multiple categories such as time, speed, quantity, etc.

The 10 Pillars of BPM

- **Nested model support** — Many processes are comprised of several sub-processes, which creates considerable complexity for organizations, often making BPM seem a daunting task.
- The BPM solution must support the use and reuse of small subprocesses in coordination and subordination to a larger, controlling process. BPM must be able to dynamically invoke a subprocess to complete a step. The user must have the capability to add a new subprocess into an existing process and have the solution automatically at run-time bind the sub-process into the higher-order process.

The 10 Pillars of BPM

- **Concurrent model support** —BPM solution must be able to support concurrent or parallel process models. These concurrent models must be able to execute independently, but also be able to join for full completion of a given process.
- If one of the concurrent models fails, then the other model must be able to complete its processing and maintain its state until the failed process is brought back online and the completion results are merged for the convergent flow of the process. No business runs on a single thread of processes. The complexity of the environment requires a solution that maps to and supports complexity.

The 10 Pillars of BPM

- **Standards based** — Because the BPM solution will touch all aspects of the environment, it's imperative that the solution support standards. It should support Unified Modeling Language (UML), importing of UML models, Extensible Markup Language (XML), and vertical industry XML standards.
 - Additionally, because BPM is a strategic layer that must work in coordination with the entire enterprise architecture, a BPM solution must support and work seamlessly with an enterprise's application integration layer. Coordination with the lower level data and application transformation layer will eliminate unnecessary processing and erroneous data conversions between systems.
 - Unified process and data integration based on open standards will improve the overall implementation and success of BPM. Standards-based computing is insurance that an investment will continue to pay dividends.
-

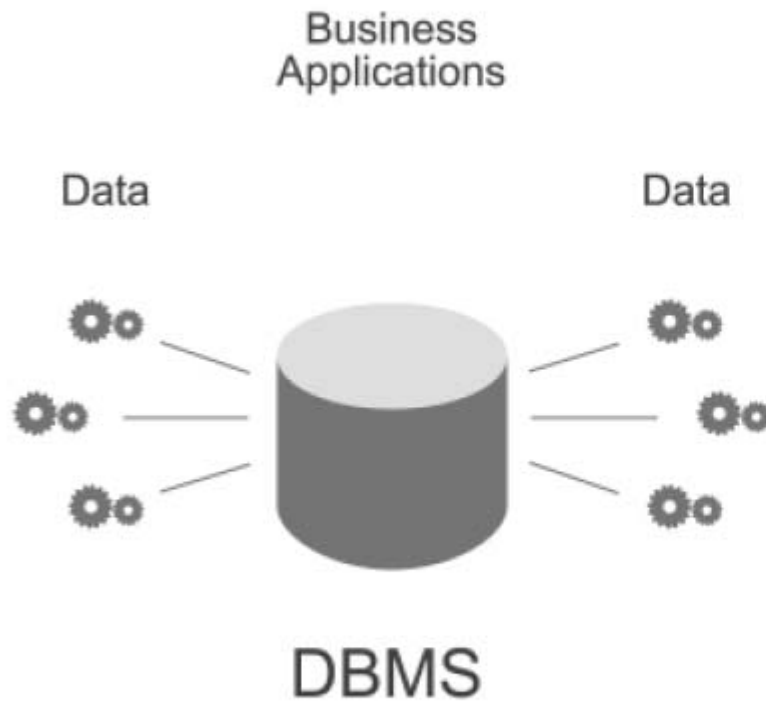
The 10 Pillars of BPM

- **High scalability** — In a complex deployment, a BPM solution could handle hundreds of processes. So the solution must scale effectively.
- Having a federated architecture that relies on centralized administration, but has no single point of failure because components can be physically distributed is key to ensuring high scalability.
- As the business grows, the software should facilitate growth, not inhibit it or become unusable.

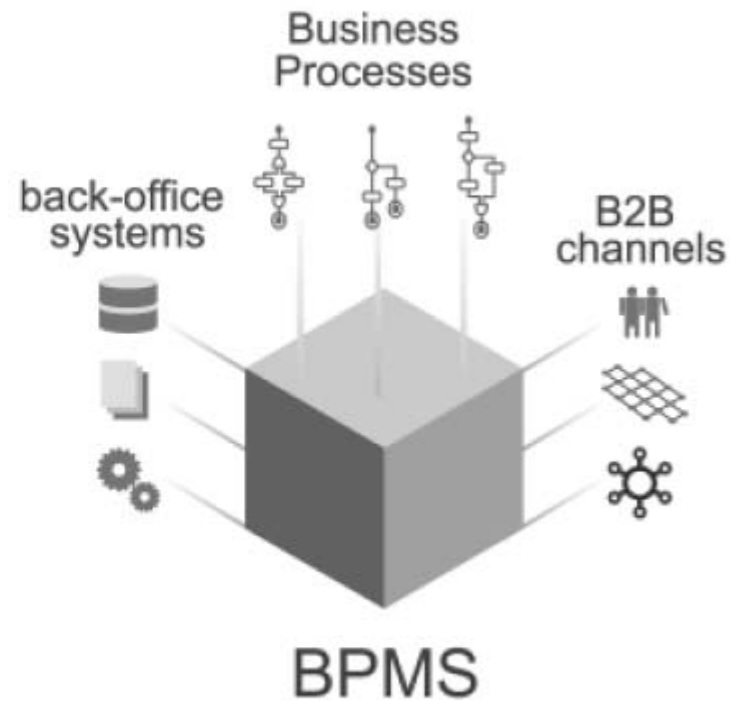
The 10 Pillars of BPM

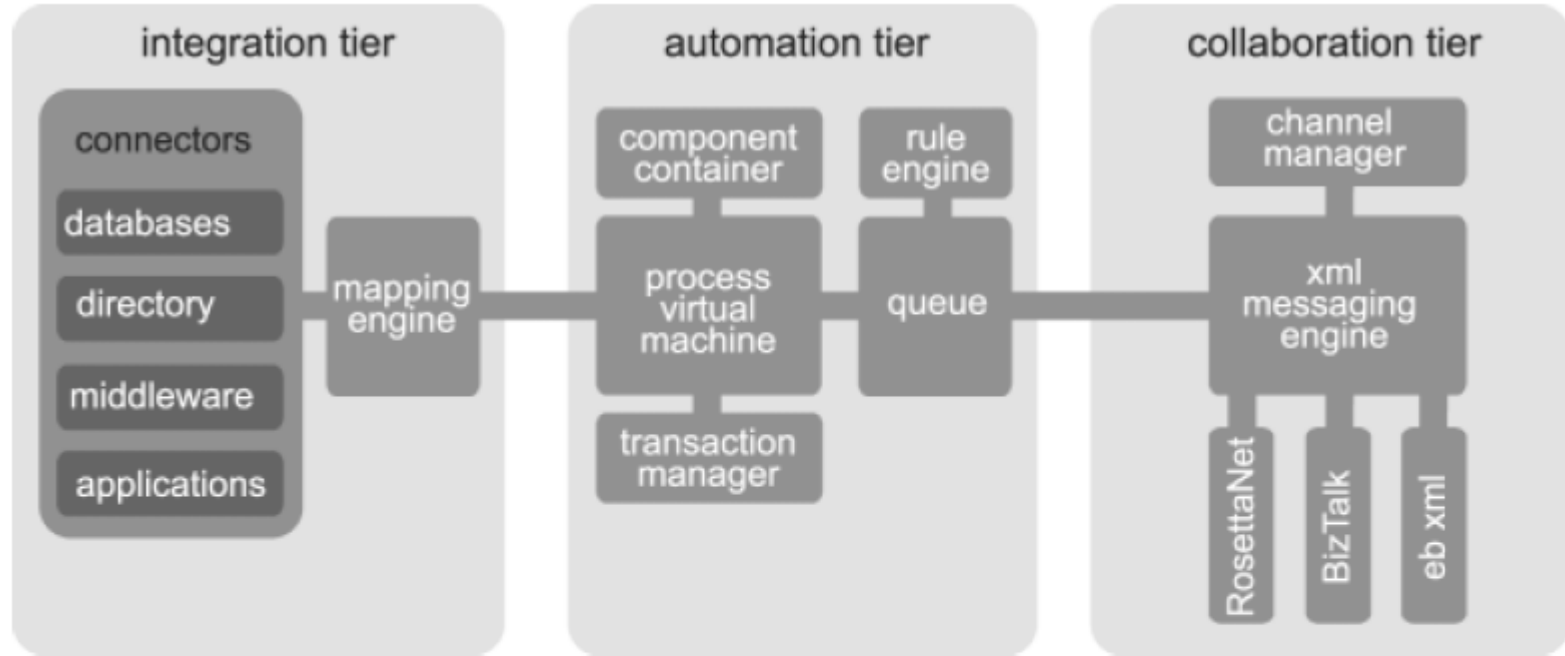
- **High reliability** — Because BPM is central and strategic, the solution must have automatic failsafe features and ensure the integrity of transactions between the BPM system and underlying integration system.
- Messages must not be lost, whether they cross applications or firewalls. Whether a process runs B2B or within an enterprise, the BPM solution should reliably maintain the process no matter what happens in the computing environment.

The past



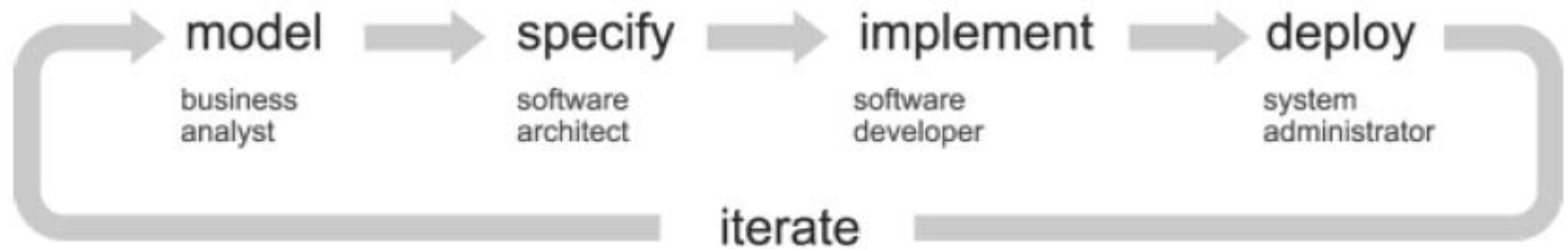
From now on





The Abstract, 3-Tier, BPMS Architecture (Simplified)

code centric approach



process centric approach



Software versus Process Development Lifecycle

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